

~~ME 1604~~  
7006  
7112



AIL Type 7006  
DIODE NOISE GENERATOR  
AND  
AIL Type 7112  
DIODE NOISE GENERATOR  
POWER SUPPLY

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CUTLER - HAMMER

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DEER PARK, LONG ISLAND, NEW YORK



AIL/  
DIVISION



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I. INTRODUCTION

The Type 7006 Diode Noise Generator (Figure 1-1) can generate excess noise power in the 10 to 250 Mc range. A 5722 diode is used as the noise source. Sufficient plate voltage is applied to ensure temperature-limited operation.

Power for the 7006 is obtained from either the AIL Type 74 Automatic Noise Figure Indicator or Type 7112 Diode Noise Generator Power Supply. When used with the Type 74 Automatic Noise Figure Indicator, either manual or automatic measurement of noise figure can be made.

When used with the Type 7112 Power Supply, manual measurement of noise figure from 0 to 16 db can be made.

II. SPECIFICATIONS\*

|                              |                 |
|------------------------------|-----------------|
| Frequency Range:             | 10 to 250 Mc    |
| Relative Excess Noise Ratio: | 0 to 16 db      |
| Noise Output Connection:     | Type BNC        |
| SWR:                         | 1.15:1          |
| Output Impedance:            | 50 ohms nominal |
| Size:                        |                 |
| Length:                      | 4-1/2 inches    |
| Width:                       | 3-1/8 inches    |
| Height:                      | 4-1/2 inches    |
| Weight:                      | 1-1/2 pounds    |

\* Subject to change without notice.

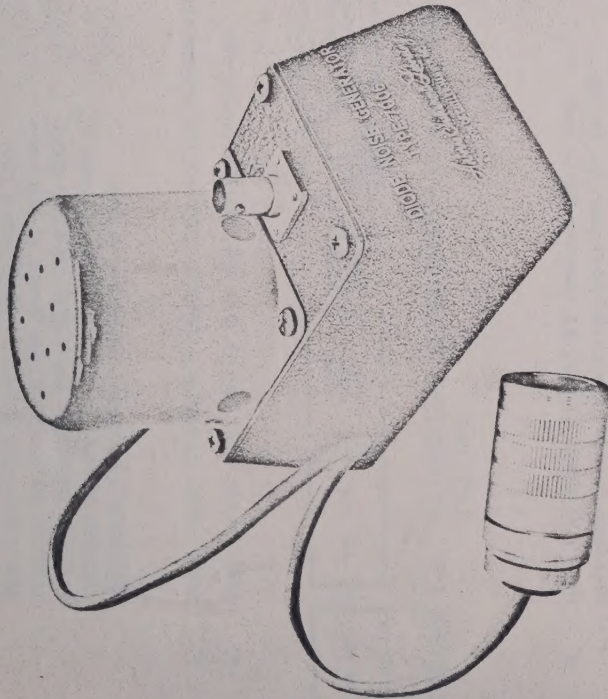


FIGURE 1-1. TYPE 7006 DIODE NOISE GENERATOR



## A. MANUAL OPERATION WITH TYPE 7112 POWER SUPPLY

1. Set up the equipment as shown in Figure 1-2.
2. Connect the power cable of the 7006 to the 7112.
3. Connect the 7112 to 117 VAC power.

### CAUTION

The Type 5722 Electron Tube has a life expectancy of about 200 hours at full output. To conserve tube life, turn the diode current control to minimum or disconnect the Noise Generator when not in use.

4. Turn diode CURRENT control fully counterclockwise.
5. Turn power ON. Allow five (5) minutes warm-up.

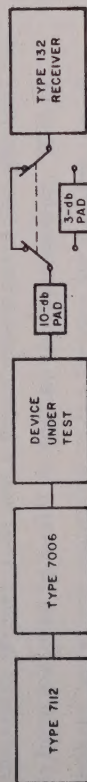


FIGURE 1-2. EQUIPMENT SETUP BLOCK DIAGRAM FOR TESTING

6. With the diode CURRENT control set in the extreme counterclockwise position, the output meter indicates the ambient-noise power level of the system. Record this reading.
7. Switch the 3-db pad into the circuit and adjust the diode CURRENT control until the output meter reads exactly the same value recorded. The noise figure of the receiver is then read directly on the panel meter of the 7112.

## B. MANUAL AND AUTOMATIC OPERATION WITH TYPE 74 AUTOMATIC NOISE FIGURE INDICATOR

Refer to the Instruction Manual for Type 74 Automatic Noise Figure Indicator for operating instructions.

The Type 7006 Diode Noise Generator consists of a filament type vacuum diode. The diode is operated at a plate voltage high enough to cause plate-current saturation (temperature-limited operation); under these conditions the DC plate current is virtually independent of plate voltage and is solely determined by the cathode emission. The excess noise power output (the ratio of available noise power of the diode to that of a pure resistance) is given by

$$T_e = \frac{e}{2KT_o} IR \quad (1)$$

where

$T_e$  = available excess-noise power output (usually expressed as a temperature ratio)

$e$  = the electronic charge ( $1.59 \times 10^{-19}$  coulomb)

$K$  = Boltzmann's constant ( $1.38 \times 10^{-23}$  joule/degree)

$T_o$  = the reference temperature ( $290^\circ K$ )

$I$  = DC plate current in amperes

$R$  = terminating resistance in ohms.

The term  $\frac{e}{2KT_o}$  is about equal to 20. Since  $R$  is known (50 ohms in the standard 7006),  $T_e$  can be easily determined by a simple DC current measurement.

The noise figure of a network can be determined by connecting its input to the noise-diode output and measuring the ratio of network noise-power output with the diode on, to that with the diode off. This ratio is called the  $Y$  factor. The network noise figure is then given by

$$F = \frac{T_e}{Y - 1} \quad (2)$$

$$F = \frac{20 IR}{Y - 1} \quad (3)$$



Term I is set at some fixed level and Y measured by turning the diode on and off. F can then be computed from the equation. The second is the constant Y factor or the 3-db method. The noise output level of the network with the diode turned off is noted. The diode is then turned on, and Id increased until the noise output is exactly doubled. Y, therefore, is equal to 2, and equation 3 reduces to

$$F = 20 \text{ IR} \quad (4)$$

The following expresses this result in db:

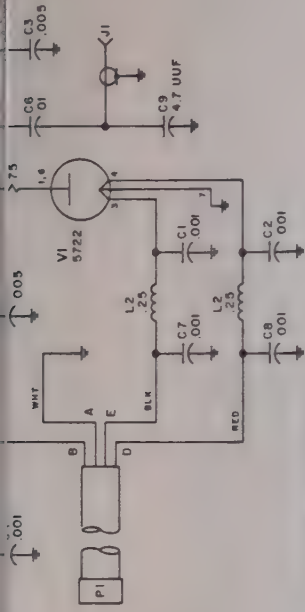
$$F_{\text{db}} = 10 \log 20 \text{ IR} \quad (5)$$

## V. MAINTENANCE

No preventative maintenance is required for the 7006. A schematic (Figure 1-3) and a replacement parts list (Section VI) have been included to assist in routine troubleshooting. If it is necessary to return equipment to the factory for repairs, use the following procedure.

## RETURN OF EQUIPMENT TO FACTORY FOR REPAIRS

If it has been found necessary to return the equipment to the manufacturer for repairs, please write first to the AIL Sales Department, giving complete information concerning the nature of the failure and the manner in which the equipment was used when failure occurred. Also provide the TYPE AND SERIAL NUMBERS of the unit. Special instructions will then be supplied to the customer for shipping the unit back for repairs. All equipment should be packed and shipped, in accordance with the instructions supplied, with transportation charges prepaid. A failure report should accompany shipment of the equipment.



UNLESS OTHERWISE NOTED:  
RESISTOR VALUES ARE GIVEN IN OHMS  $\pm 5\%$ , 1/2 WATT  
CAPACITOR VALUES ARE GIVEN IN  $\mu\text{F}$   
INDUCTOR VALUES ARE GIVEN IN  $\mu\text{H}$

FIGURE 1-3. NOISE DIODE SCHEMATIC DIAGRAM

## VI. REPLACEABLE PARTS LIST

| Symbol             | Description                             | Mfr.              | Part No.  |
|--------------------|-----------------------------------------|-------------------|-----------|
| C1, C2, C4, C7, C8 | Capacitor, ceramic, 0.001 $\mu\text{F}$ | Cornell-Dubilier  | 59TM601   |
| C3, C5             | Capacitor, ceramic, 0.005 $\mu\text{F}$ | Aerovox           | BIS-1B    |
| C6                 | Capacitor, paper, 0.01 $\mu\text{F}$    | Erie              | CC62      |
| J1                 | Connector                               | Amphenol          | UG-290A/U |
| L1                 | Choke, 14 $\mu\text{H}$                 | Speers Carbon Co. | 10102-1   |
| L2, L3             | Choke, 0.25 $\mu\text{H}$               | Speers Carbon Co. | 10100-1   |
| P1                 | Connector, power                        | Amphenol          | 165-33    |
| R1, R2             | Resistor, fixed, 100 ohms               | Mepco             | EP-012    |
| R3                 | Resistor, fixed, 75 ohms                | Allen-Bradley     | EB7505    |
| V1                 | Tube, electron                          | Sylvania          | 5722      |
| XV1                | Socket, tube                            | Sylvania          | 7470-0060 |



# I. INTRODUCTION

The AIL Type 7112 Diode Noise Generator Power Supply (Figure 2-1) is designed to operate the Type 7006 Diode Noise Generator for manual noise figure measurements. The panel meter is calibrated in db, thus permitting noise figure to be read directly.

## II. SPECIFICATIONS\*

|               |                                                         |
|---------------|---------------------------------------------------------|
| Power Input:  | 117 v, 50 to 60 cps, 1 amp                              |
| Power Output: | Filament and plate power for 5722 noise diode           |
| Size:         | Height: 7 inches<br>Width: 7 inches<br>Length: 7 inches |
| Weight:       | 7 pounds                                                |

\* Subject to change without notice.

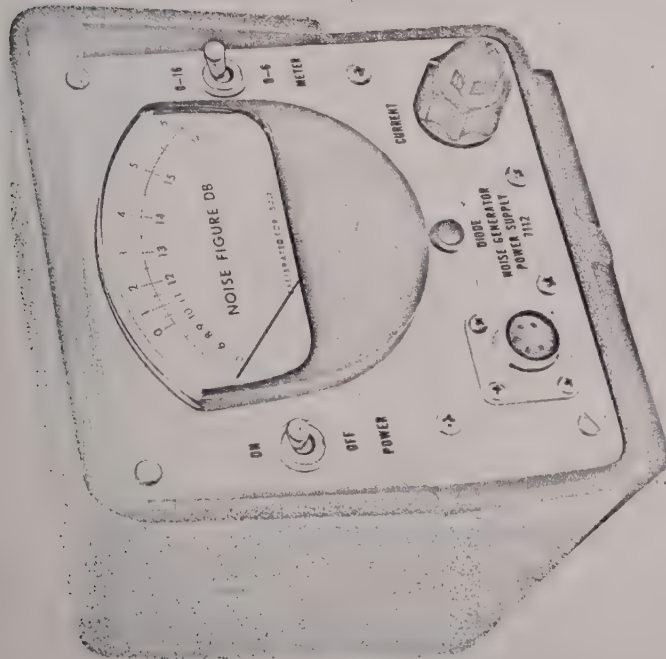
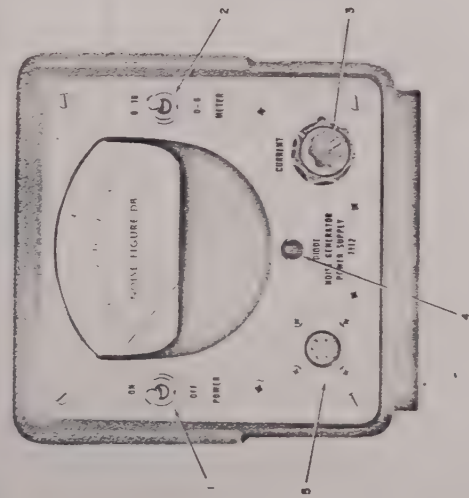


FIGURE 2-1. DIODE NOISE GENERATOR POWER SUPPLY



A. OPERATING CONTROLS (FIGURE 2-2)

| Ref | Symbol | Description         | Function                                            |
|-----|--------|---------------------|-----------------------------------------------------|
| 1   | S1     | POWER ON-OFF switch | Turns power on and off                              |
| 2   | S2     | METER switch        | Selects meter scale                                 |
| 3   | R6     | CURRENT control     | Adjusts plate current                               |
| 4   | I1     | Pilot light         | Indicates primary power on                          |
| 5   | J1     | Power connector     | Provides power connection for Diode Noise Generator |



- 1. POWER switch
- 2. METER switch
- 3. CURRENT control
- 4. Pilot light
- 5. Power connector.

FIGURE 2-2. DIODE NOISE GENERATOR POWER SUPPLY OPERATING CONTROLS AND INDICATORS

- 2. Turn Current Control fully counterclockwise.
- 3. Set meter switch to 0-6 db position.
- 4. Connect line cord to power line.
- 5. Turn POWER switch ON. Allow five (5) minutes warm-up.
- 6. Proceed with noise figure measurements as described on page 2.

IV. MAINTENANCE

No preventative maintenance is required for the 7112.

The meter shunt calibration procedure is performed

as follows:

- 1. Set up equipment as described in operating instructions (Section III).
- 2. After five (5) minutes warm-up, adjust CURRENT control for full-scale deflection of the panel meter.
- 3. Switch METER switch to 0-16 db position.
- 4. Adjust R3 for 6-db reading on panel meter (Figure 2-3).

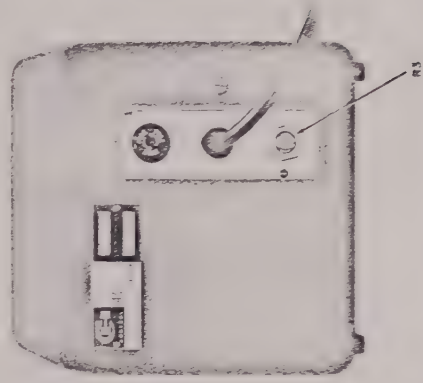
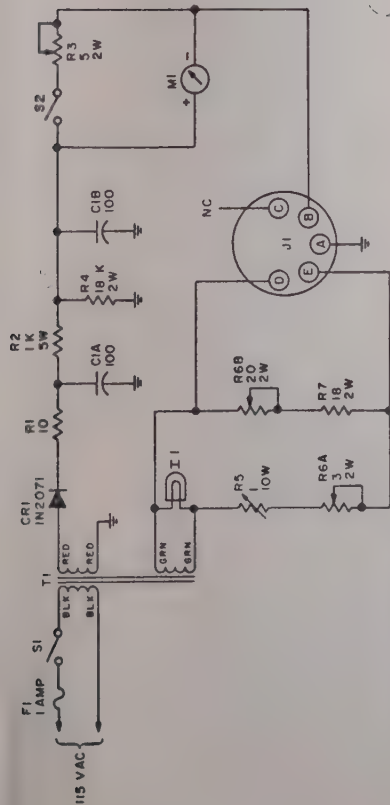


FIGURE 2-3. DIODE NOISE GENERATOR POWER SUPPLY REAR VIEW





UNLESS OTHERWISE NOTED:  
RESISTOR VALUES ARE GIVEN IN OHMS  $\pm 5\%$ , 1/2 WATT  
CAPACITOR VALUES ARE GIVEN IN UF  $\pm 20\%$ , 350 V DC WATT

FIGURE 2-4. DIODE NOISE GENERATOR POWER SUPPLY  
SCHEMATIC DIAGRAM

If it is necessary to return the equipment to the  
factory for repairs, follow the instructions given on page 4

| Symbol | Description                                                 | Mfr.              | Part No.    |
|--------|-------------------------------------------------------------|-------------------|-------------|
| C1     | Capacitor, electrolytic, $2 \times 100 \mu\text{f}$ , 350 v | Sprague           | TUL-2641    |
| CR1    | Diode                                                       | Texas Instruments | 1N2071      |
| F1     | Fuse 1A                                                     | Bussmann          | 990019-27   |
| I1     | Lamp                                                        | GE                | 117104-3    |
| J1     | Connector, power                                            | Amphenol          | 165-36      |
| M1     | Meter, panel                                                | AIL               | 119862      |
| R1     | Resistor, fixed, 10 ohms, 1/2 w                             | Allen-Bradley     | RC 20GF100J |
| R2     | Resistor, fixed, 1 k, 5 w                                   | Ohmite            | 7/8-C-54-F  |
| R3     | Resistor, variable                                          | AIL               | 118090-1    |
| R4     | Resistor, fixed, 18 k, 2 w                                  | Allen-Bradley     | RC42GF183J  |
| R5     | Resistor, variable, 1 ohm, 10 w                             | Ohmite            | 1001        |
| R6     | Resistor, variable                                          | AIL               | 116713      |
| R7     | Resistor, fixed, 18 ohms, 2 w                               | Allen-Bradley     | RC42GF180J  |
| S1, S2 | Switch                                                      |                   | 116946      |
| T1     | Transformer, power                                          | Stancor           | PA8421      |









